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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/038,806	01/02/2002	Timothy M. Takeuchi	42P13557	2936

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EXAMINER

VU, QUANG D

ART UNIT	PAPER NUMBER
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2811

DATE MAILED: 06/04/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/038,806

Applicant(s)

TAKEUCHI, TIMOTHY M.

Examiner

Quang D Vu

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on amendment filed on 03/31/03.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 7-23 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 7-23 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in-

(1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effect under this subsection of a national application published under section 122(b) only if the international application designating the United States was published under Article 21(2)(a) of such treaty in the English language; or

(2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that a patent shall not be deemed filed in the United States for the purposes of this subsection based on the filing of an international application filed under the treaty defined in section 351(a).

2. Claims 7-8 are rejected under 35 U.S.C. 102(e) as being anticipated by US Patent No. 6,297,549 to Hiyoshi.

Regarding claim 7, Hiyoshi (figure 2B) teaches an apparatus comprising:

a package substrate having top (331) and bottom (332) surface buildup layers disposed on a thermally conductive substrate core (31), wherein a portion of the substrate core is exposed at a top surface of the package substrate for attachment of a heat spreader (32, 39, 38).

Regarding claim 8, Hiyoshi teaches the exposed portion of the substrate core (31) extends around the perimeter of the top surface buildup layer (331) (see figure 2A).

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 10-13, 15 and 18-20 are rejected under 35 U.S.C. 102(b) as being anticipated by US Patent No. 6,118,177 to Lischner et al.

Regarding claim 10, Lischner et al. (figure 1) teach an apparatus comprising:
a package substrate (120) having top (125) and bottom (126) surface buildup layers disposed on a thermally conductive substrate core;
an integrated circuit (130) having a top surface and a backside surface, the integrated circuit (130) mounted on a first surface (125) of the package substrate (120) with the top surface of the integrated circuit (130) facing the package substrate (120); and
a heat spreader (140) thermally coupled to an exposed portion of the substrate core (120), a bottom surface of the heat spreader (140) thermally coupled to the backside surface of the integrated circuit (130).

Regarding claim 11, Lischner et al. teach the heat spreader (140) is thermally coupled to a perimeter portion of the substrate core.

Regarding claim 12, Lischner et al. teach the heat spreader (140) is soldered to the substrate core (120).

Regarding claim 13, Lischner et al. teach the heat spreader (140) is made of metal (column 2, lines 64-66).

Regarding claim 15, Lischner et al. teach a thermal interface material (142) disposed between the backside surface of the integrated circuit (130) and the bottom surface of the heat spreader (140) (see figures 1 and 3; column 2, lines 45-48).

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Regarding claim 18, Lischner et al. teach the integrated circuit (130) is mechanically and electrically coupled to the package substrate (120) by a plurality of solder bump interconnections (134).

Regarding claim 19, Lischner et al. teach a printed circuit board (150), wherein the package substrate (120) is mounted on the printed circuit board (150).

Regarding claim 20, Lischner et al. teach the package substrate (120) is mechanically and electrically coupled to the printed circuit board (150) by a plurality of solder bump interconnections (152).

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent No. 6,297,549 to Hiyoshi.

Regarding claim 9, Hiyoshi differs from the claimed invention by not showing the substrate core is made of metal. It would have been obvious to one having ordinary skill in the art at the time the invention was made for the substrate core is made of metal because it depends on the amount of heat that needs to be dissipate from the chip.

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7. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent No. 6,118,177 to Lischner et al.

Regarding claim 14, Lischner et al. differ from the claimed invention by not showing the substrate core is made of metal. It would have been obvious to one having ordinary skill in the art at the time the invention was made for the substrate core is made of metal because it depends on the amount of heat that needs to be dissipate from the chip.

8. Claims 16-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent No. 6,118,177 to Lischner et al. as applied to claim 10 above, and further in view of US Patent No. 6,229,204 to Hembree.

Regarding claim 16, Lischner et al. teach a convenient surface is provided for placement of a heat sink (column 4, lines 52-53). Lischner et al. differ from the claimed invention by not showing a heat sink attached to a top surface of the heat spreader. However, Hembree teaches a heat sink (28) attached to a top surface of the heat spreader (30) (see figures 5 and 6). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate a heat sink of Hembree into the device taught by Lischner et al. since it is desirable to enhance heat dissipation.

Regarding claim 17, Lischner et al. differ from the claimed invention by not showing a fan attached to the heat sink. However, Hembree teaches a fan attached to the heat sink (column 4, lines 13-14). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate a fan of Hembree into the device taught by Lischner et al. since it is desirable to increase heat dissipation.

9. Claims 21 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent No. 4,561,011 to Kohara et al. in view of US Patent No. 6,118,177 to Lischner et al.

Regarding claim 21, Kohara et al. (figure 5) teach an apparatus comprising: at least two integrated circuits (6) having top surfaces and backside surfaces, the integrated circuits (6) mounted on a first surface of the package substrate (7) with the top surfaces of the integrated circuits (6) facing the package substrate (7); and a heat spreader (16) thermally coupled to an exposed portion of the substrate core (7), wherein a bottom surface of the heat spreader (16) is thermally connected to the backside surfaces of the integrated circuits (6).

Kohara et al. differ from the claimed invention by not showing a package substrate having top and bottom surface buildup layers disposed on a thermally conductive substrate core. However, Lischner et al. teach a package substrate (120) having top (125) and bottom (126) surface buildup layers disposed on a thermally conductive substrate core (120) (see figure 1). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate a package substrate having top and bottom surface buildup layers of Lischner et al. into the device taught Kohara et al. because it provides connection between the semiconductor device and the external circuit.

Regarding claim 23, the combined device teaches the heat spreader is soldered to the substrate core (see figures 1 and 3 of Lischner et al.).

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10. Claim 22 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lischner et al. and Kohara et al. as applied to claim 21 above, and further in view of US Patent No. 6,215,670 to Khandros.

Regarding claim 22, neither Kohara et al. nor Lischner et al. teach one or more capacitors mounted on a top surface of the package substrate. However, Khandros teaches one or more capacitors mounted on a top surface of the package substrate (column 12, lines 40-43; lines 48-50). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate the capacitors of Khandros into the device taught by Lischner et al. or Kohara et al., since it is desirable to improve electrical performance of semiconductor devices operating at high frequencies.

Response to Arguments

Applicant's arguments filed 03/31/03 have been fully considered but they are not persuasive.

It is argued, in page 7 of the remark, that Hiyoshi does not teach or suggest a thermally conductive substrate core. This argument is not convincing because the ceramic substrate (31) of Hiyoshi is a thermally conductive substrate core (figure 2B). US Patent No. 5,410,449 to Brunner and US Patent No. 5,720,342 to Owens et al. teach ceramic is a thermally conductive material (column 1, lines 30-34 of Brunner; column 4, lines 37-41 of Owens et al.).

It is argued, in page 7 of the remark, that Hiyoshi does not teach or suggest a package substrate having top and bottom surface buildup layers disposed on a thermally conductive substrate core. This argument is not convincing because Hiyoshi teaches a package substrate

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having top (331) and bottom (332) surface buildup layers disposed on a thermally conductive substrate core (31).

It is argued, in page 7 of the remark, that Hiyoshi teaches the item 38, which is not a heat spreader because the item 38 is ceramic. This argument is not convincing because Hiyoshi teaches the ceramic housing 38 is a part of the heat spreader (32, 39, 38). Additionally, the ceramic material is a thermally conductive material as taught by US Patent No. 5,410,449 to Brunner and US Patent No. 5,720,342 to Owens et al.

It is argued, in page 7 of the remark, that Hiyoshi does not teach or suggest a heat spreader that attaches to an exposed portion of a thermally conductive substrate core. This argument is not convincing because Hiyoshi teaches the upper surface of the thermally conductive substrate core (31) is an exposed surface before the heat spreader (32, 39, 38) attaches to the thermally conductive substrate core (31).

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event,

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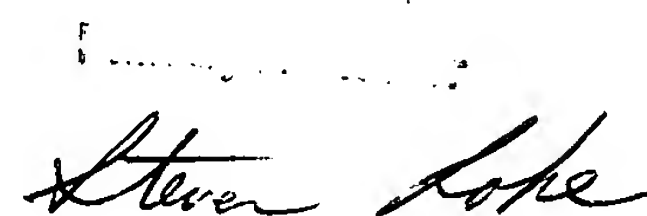
however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Quang D Vu whose telephone number is 703-305-3826. The examiner can normally be reached on Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on 703-308-2772. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7722 for regular communications and 703-308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

qv
June 2, 2003


Steven A. Hoke